

A 14 year old high school football player collapsed at the completion of a running drill in practice on September 9, 1993 and died the same day. His death was heart related and diagnosed as mitral valve prolapse. He was cleared to play football by a physician.

A 17 year old football player collapsed during a time out of a JV football game on September 16, 1993. As he was walking off the field toward his coach he collapsed. Death was heart related. The player passed his pre-season physical.

A 16 year old high school football player collapsed and died at the first day of football practice on August 11, 1993 and died later in the hospital. He had just passed his physical exam and was standing in street clothing with a group

of other players listening to the coach. An autopsy revealed cardiac arrhythmia.

A 15 year old high school football player collapsed during the second quarter of a game on September 13, 1993. He was playing outside linebacker and collapsed after a play. Death was related to an enlarged heart.

A 16 year old high school football player collapsed and died during an informal workout organized by the football team captains on July 13, 1993. They had just completed five 100 yard dashes. Cause of death was related to a congenital heart defect.

A 13 year old junior high school football player collapsed at practice on August 25, 1993, and later died. The

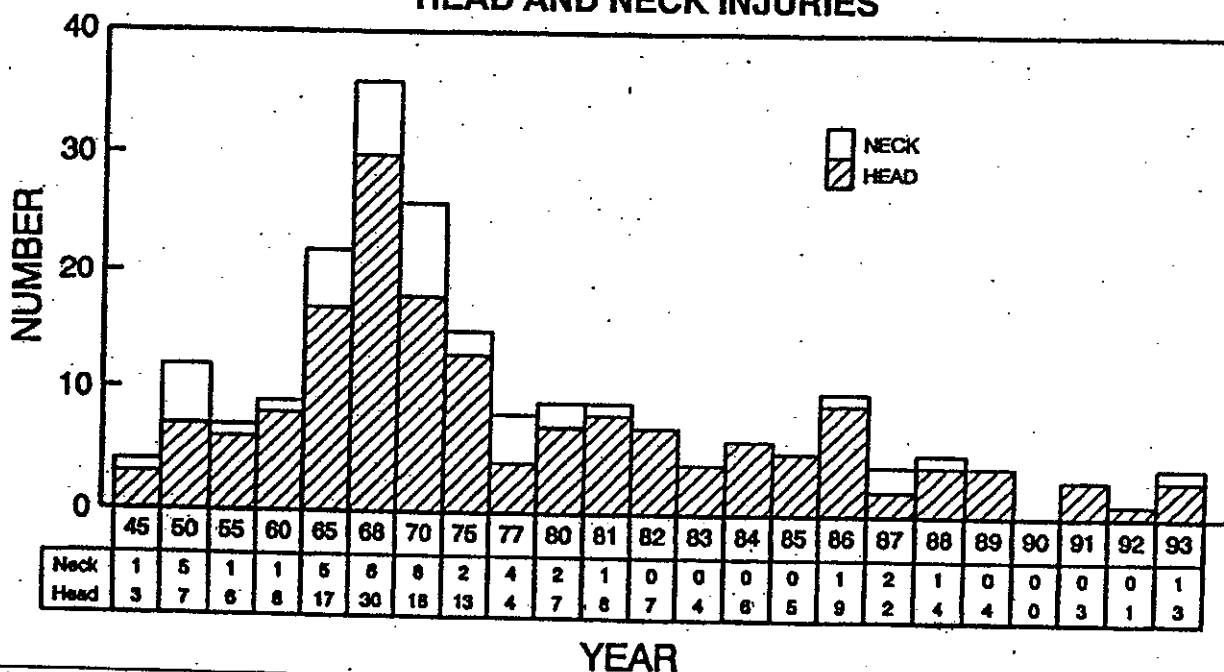
player had asthma problems but the asthma was unrelated to his death. Cause of death was listed as arrhythmia and deformity of the tricuspid valve.

A 16 year old high school football player collapsed on the first day of spring football practice in pads and died the same day - May 6, 1993. He collapsed after light jogging at the beginning of practice. At the time of this writing the exact cause of death was unknown.

College

A 20 year old college football player collapsed during a team meeting one day prior to the first day of football practice. He collapsed on August 15, 1993, and died the same day. Cause of death was listed as hypertrophic cardio-myopathy.

FOOTBALL FATALITIES HEAD AND NECK INJURIES



Adopt 'Safety First' Coaching Techniques

According to legal experts, "failure to warn" usually is one of the primary accusations made against those in the coaching profession in litigation which involves catastrophic injury to a player.

To help prevent what could result in the destruction of a coaching career, as well as massive financial loss, adopt 'safety first' coaching techniques:

- 1) Have a clear and complete understanding of the intent of correct application of safety rules.
- 2) Make graphically clear to players the risk of violating these rules and use the available 'printed' material as a constant authoritative reminder to them of the importance of correct techniques.
- 3) Point out in exact terms the risk of an 'accidental' catastrophic injury in athletics before the first practice begins.

Excerpted from an article by Dick Schindler for the National Federation News.

Coaches' Checklist

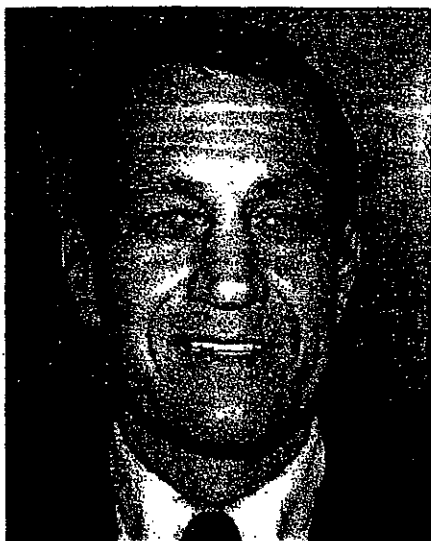
- 1) Keep the head up.
- 2) Discuss risk of injury.
- 3) Keep the head out of contact.
- 4) Explain how serious injuries occur.
- 5) Involve parents in early season meeting.
- 6) Have a set plan for coaching safety.
- 7) Clearly explain and demonstrate safe techniques.
- 8) Provide best medical care possible.
- 9) Monitor blocking and tackling techniques every day.
- 10) Repeat drills which stress proper and safe techniques.
- 11) Admonish and/or discipline users of unsafe techniques.
- 12) Receive clearance by doctor for athlete to play following head trauma.
- 13) Stress safety every day.
- 14) Don't glorify "head hunters".
- 15) Support officials who penalize illegal helmet contact.
- 16) Don't praise or condone illegal helmet contact.
- 17) Provide conditioning to strengthen neck muscles.
- 18) Entire staff must be "tuned in" to safety program.
- 19) Check helmet condition regularly.
- 20) Improper technique causes spinal-cord injuries.
- 21) Helmet must fit properly.
- 22) Be prepared for a catastrophic injury.
- 23) The game doesn't need abusive contact.
- 24) Player safety is your responsibility.
- 25) It's a game — not a job — for the players.

Keep The Head Out Of Football

A 1976 rule change that eliminated the head as the initial contact point in blocking and tackling has significantly reduced head and neck injuries in the sport over the last decade.

Coaches can do their part to continue that trend by teaching correct techniques and emphasizing proper fundamentals at all times. That way, players can avoid catastrophic injury and coaches can avoid lawsuits.

Keep the head out of football.



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Prepared for the American Football Coaches Association, Waco, Texas; the National Collegiate Athletic Association, Overland Park, Kansas; and the National Federation of State High School Associations, Kansas City, Missouri.

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Introduction

In 1931 the American Football Coaches Association initiated the First Annual Survey of Football Fatalities. The original survey committee was chaired by Marvin A. Stevens, M.D., of Yale University, who served from 1931-1942. Floyd R. Eastwood, Ph.D., Purdue University, succeeded Dr. Stevens in 1942 and served through 1964. Carl S. Blyth, Ph.D., University of North Carolina at Chapel Hill, was appointed in 1965 and served through the 1979 football season. In January 1980, Frederick O. Mueller, Ph.D., University of North Carolina at Chapel Hill, was appointed by the American Football Coaches Association and the National Collegiate Athletic Association to continue this research under the new title, Annual Survey of Football Injury Research.

The primary purpose of the Annual Survey of Football Injury Research is to make the game of football a safer and, therefore, a more enjoyable sports activity. Because of these surveys, the game of football has realized many benefits in regard to rule changes, improvement of equipment, and improved coaching techniques. The 1976 rule change that made it illegal to make initial contact with the head while blocking and tackling was the direct result of this research.

The 1990 report was historic in that it was the first year since the beginning of the research, 1931, that there was not a direct fatality in football at any level of play. This clearly illustrates that data collection and analysis is important and plays a major role in injury prevention.

Data Collection

Throughout the year, upon notification of a suspected football fatality, immediate contact is made with the appropriate officials (coaches, administrators, physicians, trainers). Pertinent information is collected through questionnaires and personal contact.

Football fatalities are classified for this report as direct and indirect. The criteria used to classify football fatalities are as follows:

Direct: Those fatalities which resulted directly from participation in the funda-

mental skills of football.

Indirect: Those fatalities which are caused by systemic failure as a result of exertion while participating in football activity or by a complication which was secondary to a non-fatal injury.

In several instances of reported football fatalities, the respondent stated the fatality should not be attributed to football. Reasons for these statements are that the fatality was attributed to physical defects that were unrelated to football injuries.

Participation numbers were updated in the 1989 report. The National Federation of State High School Associations has estimated that there are approximately 1,500,000 high school, junior high school, and non-federation school football participants in the United States. The college figure of 75,000 participants includes the National Collegiate Athletic Association, the National Association of Intercollegiate Athletics, the National Junior College Athletic Association, and an estimate of schools not associated with any national organization. Sandlot and professional football have been estimated at 225,000 participants. These figures give an estimate of 1,800,000 total football participants in the United States for the 1995 football season.

Dr. Mueller compiled and prepared the survey report on college, professional, and sandlot levels, and Mr. Richard D. Schindler of the National Federation of State High School Associations assumed responsibility for collecting and preparing the senior and junior high school phase of the study. Sandlot is defined as non-school football, but organized and using full protective equipment.

At the conclusion of the football season, both reports are compiled into this Annual Survey of Football Injury Research. This report is sponsored by the American Football Coaches Association, the National Collegiate Athletic Association, and The National Federation of State High School Associations.

Acknowledgments

Medical data for the 1995 report were compiled by Dr. Robert C. Cantu, Chairman, Department of Surgery and Chief, Neurosurgery Service, Emerson Hospital, in Concord, MA. Dr. Cantu is the Past-

President of the American College of Sports Medicine and is the Medical Director for the National Center for Catastrophic Sports Injury Research at the University of North Carolina at Chapel Hill.

Summary

1. There were four fatalities directly related to football during the 1995 football season and all four were associated with high school football. (Table I).

2. The rate of direct fatal injuries is very low on a 100,000 player exposure basis. For the approximately 1,800,000 participants in 1995, the rate of direct fatalities was 0.22 per 100,000 participants.

3. The rate of direct fatalities in high school and junior high school football was 0.27 per 100,000 participants. The rate of direct fatalities in college was 0.00 per 100,000 participants. (Table III)

4. Most direct fatalities usually occur during regularly-scheduled games. In 1995 all four direct fatalities happened in games.

5. The 1995 survey shows that three fatalities took place in October and one in September.

6. The major activities in football would naturally account for the greatest number of fatalities. In 1995 one fatality occurred while being tackled on a kick-off and the activity of the other three was unknown. (Table V)

7. In 1995 all four direct fatalities resulted from injuries to the head. (Table VI)

8. In many cases football cannot be directly responsible for fatal injuries (heart stroke, heart related and so forth). In 1995 there were nine indirect fatalities. Seven were associated with high school football, one with college football and one was associated with sandlot football. Five of the high school indirect deaths were heat related, one heart related, one related to an asthma attack, and one to lightning. The cause of the college indirect fatality was unknown but could have been related to the heat. The sandlot fatality was heart related. The heat related deaths are a major concern since there have not been this many 1972. (Table VIII)

Discussion and Recommendations

After a slight rise in the number of football fatalities during the 1986 season, the 1990 data revealed the elimination of direct

football fatalities. That was the first time in the past 59 years that there have been no direct football fatalities. There were three fatalities in 1991, two in 1992, four in 1993, one in 1994, and the 1995 data show four direct fatalities at the high school level. The 1990, 1991, 1992, 1993, 1994, and the 1995 data illustrate the importance of data collection and the analysis of this data in making

changes in the game of football that help reduce the incidence of serious injuries. An all out effort must be made to keep these figures low and to strive for the elimination of football fatalities.

Head and Neck Injuries

Past efforts that were successful in reducing fatalities to the levels indicated in the

TABLE I
Fatalities Directly Due to Football: 1931-1995*

Year	Sandlot Direct	Pro and Semipro Direct	High School Direct	College Direct	Total Direct
1931-1939	115	68	262	41	486
1940	1	1	11	1	14
1941	3	0	10	6	19
1942	6	1	12	0	19
1943	1	1	12	2	16
1944	4	1	21	3	29
1945	1	0	20	1	22
1946	1	0	20	0	21
1947	5	0	16	0	21
1948	4	1	26	5	36
1949	1	1	18	1	21
1950	2	0	23	5	30
1951	2	0	15	3	20
1952	1	1	16	2	19
1953	0	0	10	1	11
1954	0	0	13	0	13
1955	0	0	15	0	15
1956	0	0	8	0	8
1957	0	0	9	0	9
1958	0	0	2	1	3
1959	0	0	5	0	5
1960	0	0	7	0	7
1961	0	0	1	0	1
1962	0	0	2	1	3
1963	0	0	4	1	5
1964	0	0	11	1	12
1965	0	0	7	0	7
1966	0	0	7	0	7
1967	0	0	4	0	4
1968	0	0	0	0	0
1969	0	0	3	0	3
1970	0	0	2	0	2
1971	0	0	3	0	3
1972	0	0	0	1	1
1973	0	0	4	0	4
TOTALS	172	75	618	82	947

*No study was made in 1942.

**Yearly totals available from past reports.

1979, 1983, 1987, 1989, 1991, 1992, 1993, 1994, and 1995 data, and the elimination of direct fatalities in 1990 should again be emphasized. Rule changes for the 1976 football season which eliminated the head as a primary and initial contact area for blocking and tackling is of utmost importance. Coaches who are teaching helmet or face to the numbers tackling and blocking are not only breaking the football rules, but are placing their players at risk for permanent paralysis or death. This type of tackling and blocking technique was the direct cause of 36 football fatalities and 30 permanent paralysis injuries in 1968. In addition, if a catastrophic football injury case goes to a court of law, there is no defense for using this type of tackling or blocking technique. Since 1960 most of the direct fatalities have been caused by head and neck injuries. We must continue to reduce head and neck injuries.

Several suggestions for reducing head and neck injuries are as follows:

1. Athletes must be given proper conditioning exercises which will strengthen their necks so that participants will be able to hold their heads firmly erect when making contact.

2. Coaches should drill the athletes in the proper execution of the fundamental football skills, particularly blocking and tackling. Contact should always be made with the head up and never with the top of the head/helmet. Initial contact should never be made with the head/helmet or face mask.

3. Coaches and officials should discourage the players from using their heads as battering rams when blocking and tackling. The rules prohibiting spearing should be enforced in practice and in games. The players should be taught to respect the helmet as a protective device and that the helmet should not be used as a weapon.

4. All coaches, physicians, and trainers should take special care to see that the player's equipment is properly fitted, particularly the helmet.

5. When a player has experienced or shown signs of head trauma (loss of consciousness, visual disturbances, headache, inability to walk correctly, obvious disorientation, memory loss), he should receive immediate medical attention and should not be allowed to return to practice or game without permission from the proper medical authorities.

TABLE II
Fatalities Indirectly Due To Football: 1931-1995*

Year	Sandlot Direct	Pro and Semipro Direct	High School Direct	College Direct	Total Direct
1931-1959**	72	12	112	28	224
1960	0	0	2	2	4
1961	4	1	11	0	16
1962	0	1	4	2	7
1963	2	0	4	2	8
1964	3	0	12	1	16
1965	4	1	14	5	24
1966	0	0	6	2	8
1967	0	0	4	1	5
1968	2	0	8	2	12
1969	3	1	8	2	14
1970	0	0	12	2	14
1971	2	1	7	2	12
1972	0	0	10	1	11
1973	0	0	5	3	8
1974	0	0	2	0	2
1975	0	0	3	0	3
1976	0	0	6	0	6
1977	0	0	8	1	9
1978	0	0	8	1	9
1979	0	0	6	0	6
1980	0	0	6	0	6
1981	0	0	5	0	5
1982	0	0	1	1	2
1983	0	0	6	1	7
1984	0	0	4	3	7
1985	1	0	10	0	11
1986	0	0	9	2	11
1987	0	0	3	3	6
1988	0	0	3	1	4
1989	1	0	0	1	2
1990	0	0	3	1	4
1991	0	0	0	1	1
1992	0	0	3	1	4
1993	0	0	2	2	4
1994	1	0	7	1	9
TOTALS	101	17	341	88	550

*No study was made in 1947. **Yearly totals available from past reports.

Another important effort has been and continues to be the improvement of football protective equipment. It is imperative that old and worn equipment be properly renovated or discarded and continued emphasis be placed on developing the best equipment possible. Manufacturers, coaches, trainers, and physicians should continue their joint and individual efforts toward this end.

The authors of this research are convinced that the current rules which eliminate the head in blocking and tackling, coaches teaching the proper fundamentals of blocking and tackling, the helmet research conducted by NOCSAE, excellent physical conditioning, proper medical supervision and a good data collection system have played the major role in reducing fatalities and serious

head and neck injuries in football. This is best illustrated by Table IX and Graph I

TABLE III
Direct Fatalities Incidence per
100,000
1931-1995*

High School College

1931-1950	1.78	1.53
1951-1955	1.62	9.23
1956-1960	1.94	0.00
1961-1965	1.94	3.04
1966-1970	2.23	4.56
1971-1975	2.00	1.33
1976-1980	2.00	0.00
1981-1985	1.60	4.00
1986-1990	2.60	6.60
1991-1995	1.64	1.33
1931-1995	1.92	4.00
1931-1940	1.25	0.00
1941-1950	1.37	2.50
1951-1960	0.58	0.00
1961-1970	0.33	1.33
1971-1980	1.08	4.15
1981-1990	1.00	0.00
1991-1995	0.54	1.33
1931-1940	0.30	0.00
1941-1950	0.29	1.23
1951-1960	0.69	0.00
1961-1970	0.98	2.67
1971-1980	0.54	0.00
1981-1990	0.30	0.00
1991-1995	0.30	1.33
1931-1940	0.30	1.33
1941-1950	0.30	0.00
1951-1960	0.46	0.00
1961-1970	0.27	0.00
1971-1980	0.00	0.00
1981-1990	0.20	0.00
1991-1995	0.14	0.00
1931-1940	0.26	3.33
1941-1950	0.00	1.33
1951-1960	0.27	0.00

*No study was made in 1942.

†Data available from past reports
for 100,000 junior and senior high
players and 75,000 college players.

which show the increase in both head and cervical spine fatalities during the decade from 1965-1974. This time period was associated with blocking and tackling techniques

that involved the head as the initial point of contact. The reduction in head and cervical spine injuries is shown in the decade from 1975-1984. This decade was associated with the 1976 rule change that eliminated the head as the initial contact point in blocking and tackling. There is no doubt that the 1976 rule change has made a difference and that a continued effort should be made to keep the head out of the fundamental skills of football. Data from the decade 1985-1994 continues to illustrate the reduction in head and neck fatalities.

Heat Stroke

A continuous effort should be made to eliminate heat stroke deaths associated with football. Since the beginning of the survey through 1959 there were five cases of heat stroke death reported. From 1960 through 1994 there have been eighty heat stroke cases which resulted in death (Table IV). The 1995 data show four cases of heat stroke death, which is the greatest number since 1978. There is no excuse for the number of heat stroke deaths to increase, since they are all preventable with the proper precautions. Every effort should be made to continuously educate coaches concerning the proper procedures and precautions when practicing or playing in the heat. Since 1974 there has been a dramatic reduction in heat stroke deaths with the exception of 1978 when there were four. There were no heat stroke deaths in 1993 and 1994. All coaches, trainers, and physicians should place special emphasis on eliminating football fatalities which result from physical activity in hot weather.

Heat stroke and heat exhaustion are prevented by careful control of various factors in the conditioning program of the athlete. When football activity is carried on in hot weather, the following suggestions and precautions should be taken:

1. Each athlete should have a complete physical examination with medical history and an annual health history update. History of previous heat illness and type of training activities before organized practice begins should be included.

2. Acclimatize athletes to heat gradually by providing graduated practice sessions for the first seven to ten days and other abnormally hot or humid days.

3. Know both the temperature and the humidity since it is more difficult for the body to cool itself in high humidity. Use of a sling psychrometer is recommended to measure the relative humidity and anytime the wet-bulb temperature is over 78 degrees practice should be altered.

4. Adjust activity level and provide fre-

TABLE IV
Heat Stroke Fatalities 1931-1995*

Year	Total
1931-1950	0
1951-1955	1
1956-1960	0
1961-1965	4
1966-1970	3
1971-1975	3
1976-1980	5
1981-1985	0
1986-1990	4
1991-1995	6
1931-1995	11
1931-1940	2
1941-1950	3
1951-1960	5
1961-1970	8
1971-1980	11
1981-1990	4
1991-1995	4
1931-1940	2
1941-1950	3
1951-1960	5
1961-1970	8
1971-1980	11
1981-1990	4
1991-1995	4
1931-1995	89

*No study was made in 1942.

TABLE V
DIRECT FATALITIES 1995: TYPE OF ACTIVITY ENGAGED IN

Type of Activity	Sandlot	Pro	High School	College	Total
Practice Activity	0	0	4	0	4
TOTALS	0	0	4	0	4

TABLE VI
DIRECT FATALITIES 1995: CAUSE OF DEATH

Cause	Sandlot	Pro	High School	College	Total
Heat Injury	0	0	4	0	4
TOTALS	0	0	4	0	4

TABLE VII
DIRECT FATALITIES 1995: POSITION PLAYED

Position	Sandlot	Pro	High School	College	Total
Linebacker	0	0	4	0	4
Running Back	0	0	0	0	0
Defensive End	0	0	0	0	0
Defensive Back	0	0	0	0	0
TOTALS	0	0	4	0	4

TABLE VIII
INDIRECT FATALITIES 1995: CAUSE OF DEATH

Cause	Sandlot	Pro	High School	College	Total
Heat Stroke	0	0	0	0	0
Heart Problem	0	0	0	0	0
Stroke	0	0	0	0	0
Asphyxiation	0	0	0	0	0
Other	0	0	0	0	0
TOTALS	0	0	0	0	0

TABLE IX
HEAD AND CERVICAL SPINE FATALITIES

Year	HEAD		CERVICAL SPINE	
	Frequency	Percent	Frequency	Percent
1931-1970	37	13.2	37	27.6
1971-1980	115	21.7	28	19.3
1981-1990	162	34.9	42	36.2
1991-1995	69	14.8	13	12.4
TOTALS	465	100.0	116	100.0

stockings, and any excess clothing. Never use rubberized clothing or sweatsuits.

9. Some athletes are more susceptible to heat injury. These individuals are not accustomed to work in the heat, may be overweight, and may be the eager athlete who constantly competes at his capacity. Athletes with previous heat problems should be watched closely.

10. It is important to observe for signs of heat illness. Some trouble signs are nausea, incoherence, fatigue, weakness, vomiting, cramps, weak rapid pulse, flushed appearance, visual disturbances, and unsteadiness. Heat stroke victims, contrary to popular belief, may sweat profusely. If heat illness is suspected, seek physician's immediate service. Recommended emergency procedures are vital.

11. An increasing number of medical personnel are now using a treatment for heat illness that involves applying either alcohol or cool water to the skin and is followed by vigorous fanning. The fanning causes evaporation and cooling. (Source: *The First Aider*-September 1987)

Recommendations

Specific recommendations resulting from the 1995 survey data are as follows:

1. Mandatory medical examinations and medical history should be taken before allowing an athlete participate in football. The NCAA recommends a thorough medical examination when the athlete first enters the college athletic program and an annual health history update with use of referral exams when warranted. If the physician or coach has any questions about the athlete's readiness to participate, the athlete should not be allowed to play. High school coaches should follow the recommendations set by their State High School Athletic Associations.

2. All personnel concerned with training football athletes should emphasize proper, gradual, and complete physical conditioning. Particular emphasis should be placed on neck strengthening exercises.

3. A physician should be present at all games and practice sessions. If it is impossible for a physician to be present at all practice sessions, emergency measures must be provided.

4. All personnel associated with football participation should be cognizant of the

quent rest periods. Rest in cool, shaded areas with some air movement and remove helmets and loosen or remove jerseys. Rest periods of 15-30 minutes should be provided during workouts of one hour.

5. Provide adequate cold water replacement during practice. Water should always be available and in unlimited quantities to the athletes. Give water regularly.

6. Salt should be replaced daily and liberal salting of the athletes' food will accomplish this purpose. Coaches should

not provide salt tablets to athletes. Attention must be directed to water replacement.

7. Athletes should weigh each day before and after practice and weight charts checked in order to treat the athlete who loses excessive weight each day. Generally, a three percent body weight loss through sweating is safe, and a five percent loss is in the danger zone.

8. Clothing is important and a player should avoid use of long sleeves, long



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problems and safety measures related to physical activity in hot weather.

5. Each institution should strive to have a team trainer who is a regular member of the faculty and is adequately prepared and qualified.

6. Cooperative liaison should be maintained by all groups interested in the field of Athletic Medicine (coaches, trainers, physicians, manufacturers, administrators, and so forth).

7. There should be strict enforcement of game rules, and administrative regulations should be enforced to protect the health of the athlete. Coaches and school officials must support the game officials in their conduct of the athletic contests.

8. There should be a renewed emphasis on employing well-trained athletic personnel, providing excellent facilities, and securing the safest and best equipment possible.

9. There should be continued research concerning the safety factor in football (rules, facilities, equipment, and so forth).

10. Coaches should continue to teach and emphasize the proper fundamentals of blocking and tackling to help reduce head and neck fatalities. Keep the head out of football.

11. Strict enforcement of the rules of the game by both coaches and officials will help reduce serious injuries.

12. When a player has experienced or shown signs of head trauma (loss of consciousness, visual disturbances, headache, inability to walk correctly, obvious disorientation, memory loss), he should receive immediate medical attention and should not be allowed to return to practice or game without permission from medical authorities.

Case Studies: Direct Fatalities High School

An 18-year old high school football player was injured in a game on September 29, 1995 and died on September 30, 1995. He was a defensive end and played the first half of the game. It was not known how or when the injury occurred. The player died of an aneurysm in the brain.

An 18-year old high school football player was injured in a game and died on October 27, 1995. The exact activity at the time of the injury was unknown. Cause of death was a subdural hematoma.

A 16-year old high school football player was injured in a game on October 6, 1995 and died October 17, 1995. Cause of death was a brain injury, but no additional information is known at this time.

A 14-year old junior high school football player was injured in the first quarter of a game and died on October 7, 1995. He collapsed on the field but the exact activity was unknown. Cause of death was a subdural hematoma.

Case Studies: Indirect Fatalities High School

A 14-year old high school football player died of heat stroke on August 19, 1995. He collapsed after practice.

A 13-year old junior high school football player collapsed at the first day of practice on August 7, 1995 and died on August 25, 1995. Cause of death was heat stroke. He was 6-2 and weighed 240 lbs. The player did ask a coach for a drink of water but was told to wait the last ten to fifteen minutes of the practice session to end. The practice session was approximately 4 and 1/2 hours long with three 25 minute sessions of outside physical activity.

A 16-year old high school football player died of heatstroke on August 16, 1995. The temperature was in the high 90's and the heat index was 110 degrees. He was 6-1 and weighed 238 pounds. He did not pass the initial physical exam due to a heart murmur. He was later cleared to play by his

personal physician.

A 17-year old high school football player died August 26, 1995 after collapsing from heat stroke and later undergoing a liver transplant. The athlete was 6-1 and weighed 226 lbs. He was practicing in 93 degree temperature when he collapsed on August 11, 1995.

A 16-year old high school football player died on August 14, 1995 after being taken to the hospital for leg cramps. He was 6-1 and weighed 270 lbs. Cause of death was heart related.

A 16-year old high school football player suffered an asthma attack at the end of practice and later died.

A 15-year old high school football player was struck by lightning during a practice session on August 29, 1995. The athlete died. Fourteen other players were sent to the hospital.

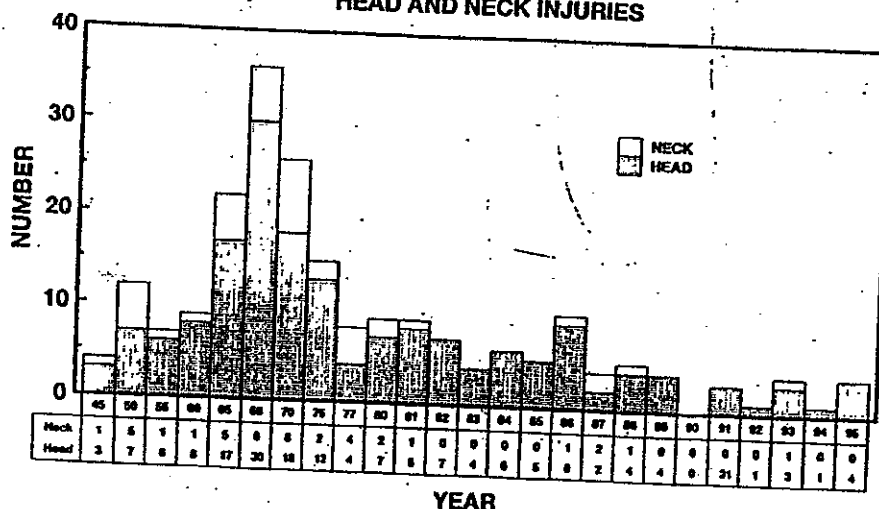
College

A 21-year old college football player collapsed at practice on August 10, 1995 and died September 5, 1995. He was dehydrated, but a ruptured spleen damaged his kidneys and caused the death.

Sandlot

A 12-year old Little League football player collapsed at practice and later died at the hospital on November 2, 1995. He was cleared to play by his physician. Cause of death was unknown at this time.

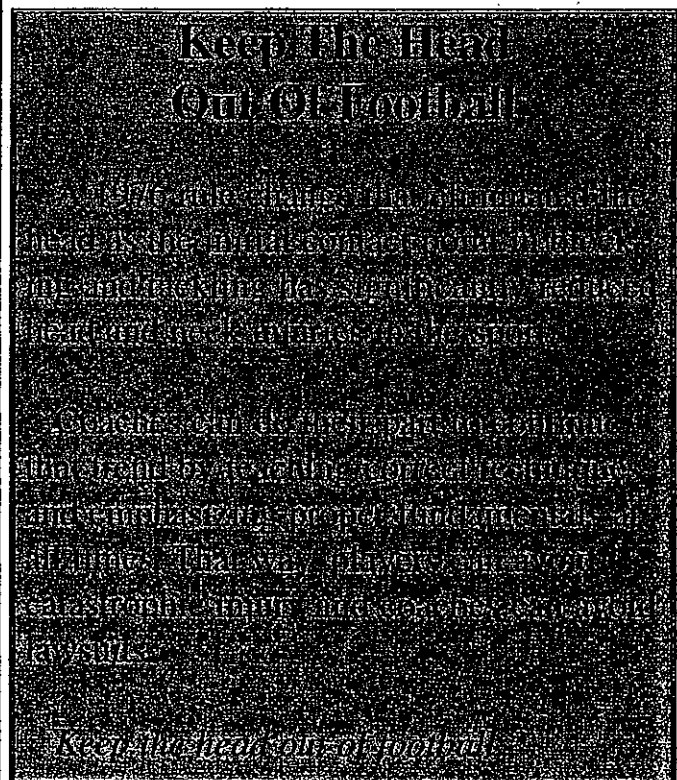
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3. Keep the head out of contact.
4. Explain how serious injuries can occur.
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11. Admonish and/or discipline users of unsafe techniques.
12. Receive clearance by doctor for athlete to play following head trauma.
13. Stress safety every day.
14. Don't glorify head hunters.
15. Support officials who penalize for illegal helmet contact.
16. Don't praise or condone illegal helmet contact.
17. Provide conditioning to strengthen neck muscles.
18. Entire staff must be "tuned in" to safety program.
19. Check helmet condition regularly.
20. Improper technique causes spinal cord injuries.
21. Helmet must fit properly.
22. Be prepared for a catastrophic injury.
23. The game doesn't need abusive contact.
24. Player safety is your responsibility.
25. It's a game — not a job — for the players.



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Pope Moseley
Deposition Exhibit 4, p. 1
(previously misidentified as
Exhibit 1)

Curriculum Vitae

Date: March 1, 2007

Name and Terminal Degrees

Pope L. Moseley, M.D., M.S.
Regents' Professor and Chair

Professional Address

University of New Mexico Health Sciences Center
Department of Internal Medicine/MSCI0 5550
1 University of New Mexico
Albuquerque, New Mexico 87131-0001
Office: 505-272-6032
FAX: 505-272-4628

Home Address

9420 Eagle Rock, NE
Albuquerque, NM 87122

Licensures

Iowa License No. 22502, 1981 (inactive)
New Mexico License No. 95-305 (expiration 07/01/2008)
New Mexico Board of Pharmacy License No. CS00017780 (expiration 01/31/2007)

Professional Affiliations

1. American Federation for Clinical Research; Councilor, Midwest Region, 1988-1993.
2. American Thoracic Society.
3. American College of Chest Physicians, Fellow.
4. American College of Sports Medicine, Fellow.
5. American College of Occupational Medicine.
6. Western Society for Clinical Investigation, Councilor, 1998-2001.
7. American Physiological Society.
8. American College of Forensic Examiners.
9. Western Association of Physicians, Councilor, 2002-2006.
10. American College of Physicians-American Society of Internal Medicine (ACP-ASIM) Fellow

Certifications

1. Diplomat, National Board of Medical Examiners, 1980; No. 222226.
2. Diplomat, American Board of Internal Medicine, 1985; No. 100854.
3. Diplomat, American Board of Internal Medicine, Subspecialty: Pulmonary Diseases, 1988; No. 100854.
4. Diplomat, American Board of Preventive Medicine, Subspecialty: Occupational Medicine, 1989; No. 22120.
5. Diplomat, National Institute of Occupational Safety and Health ("A" reader certification for Pneumoconiosis), 1991.
6. Diplomat, American Board of Forensic Examiners, 1997.

Educational History

1984-1986		Postdoctoral Research Fellow, Laboratory of R. Chalkley, Ph.D., Department of Biochemistry, University of Iowa, Iowa City, IA.
1983-1985		Fellow, Pulmonary and Critical Care Medicine, University of Iowa Hospitals and Clinics, Iowa City, IA.
1982-1983	M.S.	Preventive Medicine and Environmental Health, University of Iowa College of Medicine, Iowa City, IA.
1980-1983		Intern and Resident, Internal Medicine and Occupational Medicine University of Iowa Hospitals and Clinics, Iowa City, IA.
1976-1980	M.D.	University of Illinois College of Medicine, Chicago, IL.
1972-1976	B.S. (cum laude)	Davidson College, Davidson, NC.

Employment History

2007-Present	Regents' Professor, University of New Mexico
2001-Present	Professor and Chair, Department of Internal Medicine University of New Mexico School of Medicine Albuquerque, New Mexico
2000-2001	Associate Dean for Research, University of New Mexico School of Medicine, Albuquerque, NM.
1997-2000	Director, Program of Occupational and Environmental Health, University of New Mexico, School of Medicine, Albuquerque, NM.
1997-present	Professor, Department of Biochemistry & Molecular Biology, University of New Mexico, School of Medicine, Albuquerque, NM.
1996-present	Professor, Department of Family and Community Medicine, University of New Mexico, School of Medicine, Albuquerque, NM.
1996-present	Senior Scientist, Lovelace Respiratory Research Institute, Albuquerque, NM.
1995-2001	Chief, Division of Pulmonary, Allergy, and Critical Care Medicine, Department of Internal Medicine, University of New Mexico, School of Medicine, Albuquerque, NM.
1995-present	Professor of Medicine; University of New Mexico, School of Medicine, Albuquerque, NM.
1995-1996	Adjunct Scientist, Inhalation Toxicology Research Inst. Alb., NM
1990-1995	Associate Professor, Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, University of Iowa, College of Medicine, Iowa City, IA.
1990-1995	Associate Professor, Department of Exercise Science, University of Iowa, Iowa City, IA.
1986-1990	Assistant Professor, Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, University of Iowa, College of Medicine, Iowa City, IA.
1985-1986	Instructor, Division of Pulmonary and Critical Medicine, Department of Internal Medicine, University of Iowa, College of Medicine, Iowa City, IA.

Boards and Consultancies

1995-2004	Founder and Co-owner, Environmental Health Associates, Inc.
2000-2004	Board of Directors, Relay New Mexico
2000-present	Board of Directors, UNM Science and Technology Corporation
2001-present	Board of Directors, University Physicians Associates
2001-present	New Mexico ACP/ASIM Board Member

2003-present	Exagen, Inc. University of New Mexico Affiliation Committee
1999-present	Lovelace Respiratory Research Institute Research Program Oversight Committee
2004-present	MIND Institute Advisory Board
2005-present	Board of Directors, Lovelace Respiratory Research Institute (LRRI) Directors

Editorial Positions

1. Editorial Advisory Board, Journal of Laboratory and Clinical Medicine, 1993-1998.
2. Editorial Board, American Journal of Respiratory and Critical Care Medicine, 1993-1996.
3. Associate Editor, Exercise and Sport Sciences Review (ESSR), 2005-present.
4. Editorial Board, The American Journal of Medicine, 2005-present

AD HOC Editorial Consultant

American Journal of Physiology
 American Journal of Respiratory Cell and Molecular Biology
 American Review of Respiratory Disease
 Biochemistry
 Cancer Research
 Chest
 Comparative Biochemistry and Physiology
 Cytokine
 Journal of Applied Physiology
 Journal of Biological Chemistry
 Journal of Clinical Investigation
 Journal of Laboratory and Clinical Medicine
 Medicine and Science in Sports and Exercise

Professional Recognition, Honors

2007	Regents' Professor, University of New Mexico
2007	Visiting Senior Scholar, Center for Inflammation and Metabolism, Copenhagen Muscle Research Center, Rigshospitalet and Copenhagen University, Copenhagen, Denmark
2006	Outstanding graduate honoree, University of Iowa program in Pulmonary, Critical Care, and Occupational Medicine
1999	Visiting Scholar, School of sports Sciences, University of Sydney, NSW, Australia
1998	Ralph C. Williams Jr., M.D. UNM Department of Internal Medicine Research Award
1987	Invited Speaker, NHLBI Symposium of the NIH Centennial Celebration.
1980	Fellowship from the National Fund for Medical Education to study byssinosis among cotton workers at the High Institute of Public Health, Alexandria, Egypt.
1977	James Scholar, University of Illinois.
1976-78	Illinois General Assembly Scholarship.
1976	Phi Beta Kappa.
1973-76	Charles Dana Foundation Scholarship at Davidson College.
1969	Eagle Scout, Boy Scouts of America

Reviewing for National Funding Organizations

Administrative Work with Professional Societies, Elected Offices Held

1997	Reviewer, NHLBI Clinical Investigator Award Presentation Abstracts.
1993	NSF Reviewer for research proposals for the former Soviet Union and

	Baltic States.
1993	NIEHS P30 Centers Program Scientific Review.
1990 to 1995	Member, American Federation for Clinical Research Foundation Awards Review Committee.
1990 to 1995	Reviewer, American Heart Association Grant Awards.
1990 to 1995	Grant Review Committee, American Cancer Society Institutional Research Program (University of Iowa Cancer Center).
2003	Special Consultant, Office of Human Research Protection, Review of ARDSnet
2006-present	Special emphasis study section, National Institute of Arthritis, Musculoskeletal, and Skin Diseases
2006-present	American Thoracic Society Career Development Award Grant Review
2007	NIEHS P30 Center Review
2007-present	NIH/ NIEHS Environmental Health Sciences Review Committee

Courses Related to Management Training

1995	Team Building – University of Iowa School of Business Administration
1999	Anderson School of Management Customized Consulting and Training Program for UNM School of Medicine
2002	UNM School of Medicine Management Workshop
2002	AAMC Executive Development for Associate Deans and Department Chairs
2003	AAIM-Merck Executive Leadership Program
2007	University HealthSystem Consortium Intensive Workshop on Mortality Reduction

Fiscal Management Positions

UNM School of Medicine Finance Committee 2002-present
UNM School of Medicine Facilities Task Force 2002-203
University Physician Associates Financial Review Task Force 2003-2007
UNM Health Sciences Center Executive Clinical Leadership Board 2004-present
Chair, UNM Health Sciences Center Task Force on Uncompensated Care 2005
Chair, UNM Health Sciences Center Task on Hospital Renovations for Adult Services (Backfill) 2006
University of New Mexico Medical Group, Board of directors 2007-present
University of New Mexico Medical Group, Executive Board 2007-present

Voluntary Services

NM Legislature – Public Service and Legislative Process, April 2003

Invited Seminar and Symposia (Selected)

1. The Clinical Application of Techniques of Molecular Biology, American College of Chest Physicians Annual Meeting, 1986.
2. National Heart, Lung and Blood Institute Centennial Event Research Symposium, 1987.
3. "Heat Shock Gene Regulation by Oxidants," Lung Immunochemical Research Laboratory, University of Birmingham Hospital, Birmingham, England, 1989.
4. "Drug Induced Lung Disease," American Thoracic Society Annual Meeting, May 14 1991.
5. "Exercise, Heat and Thermotolerance: Molecular Mechanisms," Conference on Exercise, Heat and Thermoregulation, Baveno, Italy, June 18-21, 1992.
6. "Potential Role of Heat Shock Proteins in Organic Dust Induced Airway Disease," National Meeting of the NIEHS Centers Board of Directors, November 19-20, 1992.
7. "Environment Stress: HSP70 Regulation *in Vivo* and *In Vitro*," The Lovelace Medical Foundation Institute for Basic and Applied Research, Albuquerque, NM, January 31, 1994.
8. "Application of the Tissue Stress Response," American College of Sports Medicine Annual Meeting, May 31, 1995.

9. "Heat Stroke and Endotoxemia: Applied Molecular Mechanisms," Biennial Conference on the Biochemistry of Exercise, Sydney, Australia, September 25-27, 1995.
10. "Molecular Biology and Physiology: Building the Bridge," American College of Sports Medicine Annual Meeting, Cincinnati, OH, May 1996.
11. "Heat-related Illness," International Pre-Olympic Scientific Conference, Dallas, TX, July 10-14, 1996.
12. 30th European Conference on Hyperthermia, Berlin, Germany, April 1-5, 1997.
13. "Occupational Asthma," Mayo Clinic's Eighth Annual Pulmonary & Infectious Diseases Seminar, Tucson, AZ, October 4, 1997.
14. "Heat Stroke," Mayo Clinic's Eighth Annual Pulmonary & Infectious Diseases Seminar, Tucson, AZ, October 5, 1997.
15. "COPD," Update and Review of Internal Medicine, 1997, Beth Israel Deconness Medical Center and the University of New Mexico, Albuquerque, NM, October 14, 1997.
16. "Heat Shock Proteins," New York Academy of Sciences Conference: Molecular Mechanism of Fever, Santa Fe, NM November 2-4, 1997.
17. "Heat Shock Proteins and the Immune Response," Humboldt University, Berlin, Germany, November 14, 1997.
18. "Heat Shock Proteins and the Immune Response: A New Job for the Stress Family," Western Association of Physicians, Carmel, CA, February 4, 1998.
19. ALA Asthma Research Center," New Mexico Thoracic Society, 26th Annual Lung disease Symposium, Santa Fe, New Mexico, February 1998.
20. "Heat Shock Proteins, Free Radicals, and Oxidative Stress: Integration of Basic Science with Exercise Stress," American College of Sports Medicine Annual Meeting, Orlando, FL, June 2-5, 1998.
21. 1998 ALA/ATS International Conference, Chicago, Illinois, April 2-5, 1998.
22. "Immune Modulation by Heat Shock Proteins," John B. Pierce Laboratory, Yale University, New Haven, Conn., May 19, 1998.
23. "Update on COPD," Update and Review of Internal Medicine 1998, UNM School of Medicine and Beth Israel; Deaconess Medical Center, Albuquerque, New Mexico, October 11-16, 1998.
24. "Modulation of Cytokines by the Heat Shock Response," International Charite' Symposium, Berlin, Germany, October, 1998.
25. "Heat Shock Protein Vaccines for Tumor Immunotherapy," International Charite' Symposium, Berlin, Germany, October 1998.
- "Heat Shock Protein and the Immune Response," Research Institute for Molecular Pathology, Vienna, Austria, October 1998.
- "Immune Therapy Strategies in Lung Cancer," International Conference on Immune Therapy and Lung Cancer, Vienna, Austria, May 3-7, 1999.
26. "Impact of Aging on HSP70 Accumulation and Thermotolerance with Heat Stress," American College of Sports Medicine, Annual Meeting, Seattle, WA, June 3-5, 1999.
27. University of Sydney, Faculty of Health Sciences, Sydney, Australia, July-September, 1999.
28. "Stress Proteins and the Immune Response," Lovelace Respiratory Research Institute's International Symposium: Respiratory Immunology. Santa Fe, NM. October 10-13, 1999.
29. "Exercise Stress, and the Immune Conversation," University of Colorado at Boulder, CO. December 1-3, 1999.
30. "Stress Proteins and Physical Exercise," at the International Symposium on Training, Overtraining and Regeneration in Sport in Ulm, Germany. October 26-28, 2000.
31. "Heat Shock Protein: Environmental and Exercise Stress," at the Annual Meeting of the American Society for Biochemistry and Molecular Biology (FASEB), Experimental Biology 2001, in Orlando, FL. April 1, 2001.
32. Update and Review of Internal Medicine," University of New Mexico/Beth Israel-Deaconess Medicine, Santa Fe, New Mexico, October 20-25, 2002.
33. Roger Larsen Visiting Professor; University of California, San Francisco, Fresno Regional Medical Center, November 18-19, 2002

34. "Pathogenesis Hypotheses of Exertional Heat Injury/Stroke," American College of Sports Medicine, San Francisco, CA, May 28-31, 2003
35. "Heat Shock Proteins: Understanding the Immune/Inflammatory Paradox," International Symposium on Exercise and Immunology (ISEI) Copenhagen, Denmark, July 17-19, 2003.
36. Invited Speaker, "Asthma Update", Update and Review of Internal Medicine, University of New Mexico/Beth Israel-Deaconess Medicine, Santa Fe, New Mexico, October 19-24, 2003.
37. "Occupational Lung Disease," 2003 NM Chapter Scientific Meeting, Albuquerque, NM, November 13-15, 2003
38. Invited Speaker: "Cytokines, Muscle, and Metabolism," 2004 APS Intersociety Meeting- Integrative Biology of Exercise, Austin, Texas, October 6-9, 2004
39. Invited Speaker: "Immune Activation by Heat Shock" IUPS Commission on Thermal Physiology Symposium on Temperature Regulation, Rhodes, Greece, October 10-15, 2004
40. Invited Speaker: "Physiological Thermotolerance: Protein Stability and Endotoxin Tolerance, Copenhagen Muscle Research Institute, Copenhagen, Denmark, September 25, 2006.
41. Invited Speaker, 19th International Puijo Symposium: "Physical Activity, Muscle Metabolism and Chronic Diseases" Kuopio, Finland, June 27 - 29, 2007

Original Research or Scholarly Articles in Refereed Journals

1. Moseley P, Kohler JP, Rice CL, Schwartz J, Zarins C, Gould S, Kerstein M and Moss G. Does Sepsis Reduce Threshold Hydrostatic Pressure in Pulmonary Edema? *Surg Forum* 30:170-172, 1979.
2. Moseley P and Kerstein MD. Pregnancy and Thrombophlebitis. *Surg Gynecol Obstet* 150(4):593-599, 1980.
3. Kohler J, Rice C, Moseley P, Schwartz J, Zarins C, Gold S and Moss G. Sepsis Reduces the Threshold for Pulmonary Edema in Baboons. *J Surg Res* 30:129-134, 1981.
4. Moseley P, Gold R, Field R and Rodriguez-Erdmann F. Hemophilia, Maintenance Hemodialysis, and Septic Arthritis. *Arch Int Med* 141:138-139, 1981 (Case report).
5. Kerstein MD, Kohler JP, Gould S and Moseley PL. Pulmonary Extraction of Biogenic Amines During Septic Shock. *Am Surgeon* 48:552-554. 1982.
6. Cobb WB, Helms CM and Moseley PL. Toxic Shock Syndrome in a Young Man with a Pilonidal Abscess. *N Engl J Med* 306:1422-1423, 1982. (Case Letter)
7. Goldsmith JC, Moseley PL, Monick M, Brady M and Hunninghake GW. T-lymphocyte Subpopulation Abnormalities in Apparently Healthy Patients with Hemophilia. *Ann Int Med* 98:294-297, 1983.
8. Moseley PL, Shasby DM, Brady M and Hunninghake GW. Lung Parenchymal Injury Induced by Bleomycin. *Am Rev Respir Dis* 130:1082-1086, 1984.
9. Goldsmith JC, Moseley PL, Monick MM, McCormick JJ, Walker DY and Hunninghake GW. Immunologic Profiles of Adult Hemophiliacs. *J AIDS Res* 1(3):163-179, 1984.
10. Metzger WJ, Nugent KM, Richerson HB, Moseley PL, Lakin R, Zavala D and Hunninghake GW. Methods for Bronchoalveolar Lavage in Asthmatic Patients Following Broncho-provocation and Local Antigen Challenge. *Chest* 87(1):16S-19S, 1985.
11. Moseley PL, Hemken C and Hunninghake GW. Augmentation of Fibroblast Proliferation by Bleomycin. *J Clin Invest* 78:1150-1154, 1986.
12. Moseley PL, Nugent KN, Monick M and Hunninghake GW. Interferon Growth Factor Activity for Human Lung Fibroblasts. *Chest* 89:657-662, 1986.
13. Metzger WJ, Moseley PL, Richerson HB, Zavala DC, Iwamoto P, Monick M, Sjoerdsma K and Hunninghake GW. Local Allergen Challenge and Bronchoalveolar Lavage of Allergic Asthmatic Lungs. *Am Rev Respir Dis* 135:443-440, 1987.
14. Moseley PL and Chalkley R. Bleomycin Induced DNA Damage *in Vitro* and in Intact Cells. *J Lab Clin Med* 110:618-623, 1987.

15. Fick RB, Metzger WJ, Richerson HB, Zavala DC, Moseley PL, Schoderbek WE and Hunninghake GW. Increased Bronchovascular Permeability Following Allergen Exposure in Asthmatics. *J Appl Physiol* 63:1147-1155, 1987.
16. Moseley PL, Monick M and Hunninghake GW. Divergent Effects of Silica on Lymphocyte Proliferation and Immunoglobulin Production. *J Appl Physiol* 65:350-357, 1988.
17. Moseley PL, York SJ and York J. Bleomycin Induces Expression of the HSP 70 Heat Shock Promoter. *Am J Resp Cell Mol Biol* 1:89-93, 1989.
18. Gotchall J, Comried L, Bredlau G and Moseley PL. Evaluation of an Inaccurate Pulmonary Artery Catheter Thermistor. *Chest* 96:941-943, 1989.
19. Jolles H, Moseley PL and Peterson MW. Nodular Pulmonary Opacities in Patients with Rheumatoid Arthritis. *Chest* 96(5):1022-1025, 1989.
20. Moseley PL. Augmentation of Bleomycin-Induced DNA Damage in Intact Cells. *Am J Physiol: Cell* 257:882-887, 1989.
21. Solomon LR, Beerelli RD and Moseley PL. Bleomycin: Fe can Degrade DNA in the Presence of Excess EDTA *in Vitro*. *Biochemistry* 28:9932-9937, 1989.
22. Ryan AJ, Gisolfi CV and Moseley PL. Synthesis of the 70kD Stress Protein in Exercising Humans. *J Appl Physiol* 70:466-471, 1991.
23. Peterson MW, Geist L and Moseley PL. Mortality Following Cardiopulmonary Resuscitation in the Medical Intensive Care Unit. *Chest* 100:168-174, 1991.
24. Buettner GR and Moseley PL. Ascorbate both Activates and Inactivates Bleomycin by Free Radical Generation. *Biochemistry* 31:9784-9788, 1992.
25. Ryan AJ, Flanagan S, Moseley PL and Gisolfi CV. Acute Heat Stress Protects Rats Against Endotoxin Shock. *J Appl Physiol* 73:1517-1522, 1992.
26. Cox G, Moseley PL and Hunninghake GW. Induction of Heat Shock Protein 70 in Neutrophils During Exposure to Subphysiological Temperatures. *J Infect Dis* 167:769-771, 1993.
27. Buettner GR and Moseley PL. ESR Spin Trapping of Radicals Produced by Iron, Bleomycin, and Ascorbate. *Free Rad Res Commun* 19:589-593, 1993.
28. Moseley PL, McCafferty JD, Wallen E, Flanagan S and Kern JA. Heat Stress Regulates the Human 70kD Heat Shock Gene Through Its 3' Untranslated Region. *Am J Physiol* 64:L533-L537, 1993.
29. Paulus JA, Tucker RD, Flanagan SW and Moseley PL. Heat Shock Protein Response to Interstitial Thermotherapy in a Prostate Tumor Model. *Prostate* 23:263-270, 1993.
30. Moseley PL, Gapen C, Wallen ES, Walter ME and Peterson MW. Thermal Stress Induces Epithelial Permeability. *Am J Physiol (Cell)* 36:425-434, 1994.
31. Moseley KA and Moseley PL. The TDD: An Inclusion Tool. *Perspectives in Education and Deafness*, 13:10-12, 1994.
32. Flanagan SW, Ryan AJ, Gisolfi CV and Moseley PL. Tissue Specific HSP70 Response in Animals Undergoing Heat Stress. *Am J Physiol* 268:R28-32, 1994.
33. Hall DM, Oberley TW, Oberley LW, Moseley PL, Gisolfi CV. Hyperthermia Stimulates HSP70 Synthesis and increases the Concentration of Mnsod in Splanchnic Viscera of the Rat. *FASEB Journal* 9:256, 1995.
34. Gapen C and Moseley PL. Acidosis Alters Hyperthermic Cytotoxicity and the Cellular Stress Response. *Thermal Biology* 20:321-325, 1995.
35. Kregel KC, Moseley PL, Skidmore R, Gutierrez J and Guerriero V. HSP70 Accumulation in Tissues of Heat-Stressed Rats is Blunted with Advancing Age. *J Appl Physiol* 79(5):1673-1678, 1995.
36. Kregel KC and Moseley PL. Differential Effects of Exercise and Heat Stress on Liver HSP70 Accumulation with Aging. *J Appl Physiol* 80(2):547-551, 1996.
37. Moseley PL, Blanck PD and Merritt R. Hospital Privileges and the Americans with Disabilities Act. *Spine* 21(1):2288-2293, 1996.
38. Mittelberg KN, Tucker RD, Loening SA and Moseley PL. Effect of Radiation and Hyperthermia on Prostate Tumor Cells with Induced Thermal Tolerance and the Correlation with HSP70 Accumulation. *Urologic Oncology* 2:146-151, 1996.

39. Roigas J, Wallen ES, Loening SA and Moseley PL. β -galactosidase as a Marker of HSP70 Promoter Induction in Dunning R3327 Prostate Carcinoma Cells. *Urological Research* 25:251-25, 1997.
40. Kluger MJ, Rudolph K, Soszynski D, Conn CA, Leon LR, Kozak W, Wallen ES and Moseley PL. Effect of heat stress on LPS-induced fever and tumor necrosis factor. *Am J Physiol.* 273(42): R858-R863, 1997.
41. Rudolph D, Soszynski D, Kozak W, Conn CA, Leon LR, Kluger MJ, Wallen ES, Moseley PL. Effect of heat stress on LPS-induced fever. *FASEB J* 11:518, 1997
42. Wallen E, Buettner GR and Moseley PL. Oxidants Differentially Regulate the Heat Shock Response. *Int J Hyperthermia* 13(5): 517-524, 1997.
43. Roigas J, Wallen ES, Loening SA and Moseley PL. Effects of combined treatment of chemotherapeutics and hyperthermia on survival and the regulation of heat shock proteins in dunning R3327 prostate carcinoma cells. *Prostate* 34:195-202, 1998.
44. Flanagan SW, Moseley PL and Buettner G. Increased flux of free radicals in cells subjected to hyperthermia: detection by electron paramagnetic resonance spin trapping. *FEBS Letters*, 431:285-286, 1998.
45. Chang RT, Lambert GP and Moseley PL. Effect of estrogen supplementation on exercise thermoregulation in pre-menopausal females. *J Appl Physiol* 85(#6):2082-2088, 1998,
46. Roigas J, Wallen ES, Loening SA, Moseley PL. Heat shock proteins (HSP72) surface expression enhances the lysis of a human renal cell carcinoma by IL-2 stimulated NK cells. *Advances in Experimental Medicine and Biology* 451:225-229, 1998
47. Iwamoto GK, Ainsworth A, Moseley P. Hyperthermia enhances cytomegalovirus regulation of HIV-1 and TNF α gene expression. *Am J Physiol.* 277:L1051-L1056, 1999
48. Hall DM, Oberley TD, Moseley PL, Buettner GR, Oberley LW, Weindruch R, Kregel KC. Caloric restriction improves thermotolerance and reduces hyperthermia-induced cellular damage in old rats. *FASEB J* 14:78-86, 2000
49. Hall DM, Xu L, Drake, VJ, Oberley TD, Moseley PL, Kregel, KC. Aging reduces adaptive capacity and stress protein expression in the liver after heat stress. *J Appl Physiol.* 89:749-759, 2000.
50. Glötzer J, Saltih M, Chicocca S, Michon A, Moseley PL, Cotten M. A DNA tumor virus protein GAM-1 has the essential function in virus replication of activating a heat shock response. *Nature* 407(6801):207-211, 2000.
51. Dokladny K, Kozak A, Wachulec M, Wallen E, Menache M, Kozak W, Kluger M, Moseley PL. Effect of heat stress on LPS-induced febrile response in D-galactosamine sensitized rats. *Am J Physiol.: Reg, Integ and Comp Physiol.* 280: R338-R344, 2001.
52. Walsh RC, Koukoulas I, Garnham A, Moseley PL, Hargreaves M, Febbraio MA. Exercise increases serum Hsp72 in humans. *Cell Stress Chaperones.* 6(4): 386-93, 2001.
53. Lambert GP, Gifolfi CV, Berg DJ, Moseley PL, Oberley LW, Kregel KC. Hyperthermia-induced intestinal permeability and the role of oxidative and nitrosative stress. *J Appl Physiol.* 2002 Apr; 92(4): 1750-61.
54. Roigas J, Wallen ES, Loening S and Moseley PL. Estramustine phosphate enhances the effects of hyperthermia and induces the small heat shock protein HSP27 in the human prostate carcinoma cell line PC-3. *Urol. Res*, 2002, May; 30(2): 130-5.
55. Harkins MS, Moseley PL, Iwamoto GK. Regulation of CD23 is important in the chronic inflammatory response in asthma: A role for γ -IFN and HSP 70 in the Th2 environment. *Asthma Immunol.* 91(6):567-74, 2003
56. Savell, J, Ma Y, Morrow KS, Jove R, Olashaw N, Moseley PL, Cress WD, Wharton W. AG490 Inhibits G_1/S Traverse in Balb/c-3T3 cells following either mitogenic stimulation or exogenous expression of E2F-1 *Mol. Cancer Ther.* 3:205-213, 2004
58. Roigas J, Jensen CA, Wallen ES, Loening SA, Wharton W, and Moseley PL. Repression of thermotolerance in Dunning R3327 Prostate Carcinoma Cells by 2-Deoxyglucose. *Int. J. Hyperthermia.* 20: 557-566, 2004

57. Raj DSC, Dominic EA, Pal A, Osman F, Morgan M, Pickett G, Shah VA, Ferrando A, **Moseley PL**. Skeletal muscle, cytokines, and oxidative stress in end-stage renal disease. *Kidney Int'l*: 68:2338-2344, 2005
58. Dokladny K, **Moseley PL**, Ma TY. Physiologically relevant increase in temperature causes an increase in intestinal epithelial tight junction permeability. *Am J Physiol: Gastro*: 290:2; G204-212, 2006.
59. Shah VO, Dominic EA, **Moseley P**, Pickett G, Fleet M, Ness S, Raj DS. Hemodialysis modulates gene expression profile in skeletal muscle. *Am J Kidney Dis* 48(4): 616-28, 2006.
60. Dokladny K, Wharton W, Lobb R, Ma TY, **Moseley PL**. Induction of Physiological Thermotolerance in MDCK Monolayers: Contribution of HSP70. *Cell Stress Chaperones* 11:268-75, 2006.
61. Melendez KF, Mobarak C, Bear DG, Wallen ES, Edwards B, and **Moseley PL**. Heat Shock Protein Surface Expression in Human Breast Cells. *Cell Stress Chaperones* 11:334-42, 2006
62. Guo S, Wharton W, **Moseley PL**, Shi H. Heat Shock Protein 70 Regulates Cellular Redox Status by Modulating Glutathione Related Enzyme Activities. *Cell Stress Chaperones* 12:245-254, 2007.
63. Yamada P, Amorim F, **Moseley PL**, Robergs R, Schneider S. Effect of Heat Acclimation on Heat Shock Protein 72 and Interleukin-10 in Humans. *J Appl Physiol* 103:1196-1204, 2007.
64. Raj DSC, Boivin MA, Dominic EA, Boyd A, Roy PK, Rihani T, Tzamaloukas AH, Shah VA, and **Moseley PL**: Hemodialysis Induces Mitochondrial Dysfunction and Apoptosis. *Eur J Clin. Invest.* 37:971-7, 2007.
65. Dokladny K, Ye D, Kennedy J, **Moseley PL**, and Ma TY. Cellular and Molecular Mechanisms of Heat Stress Induced Upregulation of Occludin Protein Expression: Regulatory Role of HSF-1 *Am. J. Path* 172:659-70, 2008 epub.
66. Raj DSC, **Moseley P**, Dominic EA, Onime A, Tzamaloukas AH, Boyd A, Shah VH, Glew R, Ferrando A: Interleukin-6 Modulates Hepatic and Muscle Protein Synthesis during Hemodialysis. *Kidney Int'l*. Feb 20, 2008 epub.
67. Dokladny K Lobb R, Wharton W, Ma T, **Moseley PL**: Repression of Cytokine Levels in Heat-Conditioned Rats Is Mimicked by Elevated Expression of HSP70. *Am J Physiol: Cell* (in revision).
68. Dokladny K, Wharton W, Ma TY, **Moseley PL**: Lack of Cross-Tolerance Following Heat and Cadmium Exposure in Functional MDCK Monolayers. *J. Appl. Tox.* (in press).
69. van Hall G, Steensberg A, Fischer C, Keller C, Hiscock N, Møller K, Saltin B, **Moseley PL**, and Pedersen B: Interleukin-6 Markedly Decreases Skeletal Muscle Protein Turnover and Increases Non-muscle Amino Acid Utilization in Healthy Individuals. *J. Clin Endo Met.* (in press).
70. Amorim F, Yamada P, Schneider S, and **Moseley PL**: Rate of Heat Storage and Serum Heat Shock Protein 72 Concentration in Humans (submitted).

Review Articles

1. **Moseley PL** and Gisolfi CV. New Frontiers in Thermoregulation and Exercise. (Invited "Lead Article") *Sports Medicine* 16:163-167, 1993.
2. **Moseley PL**. Molecular Aspects of Thermotolerance and Heat Acclimatization. (Invited Paper) *J Lab Clin Med* 123:48-53, 1994.
3. **Moseley PL**. Heat Shock Proteins in Human Disease (Invited Commentary). *J Lab Clin Med* 128:223-224 1996.
4. **Moseley PL**. "Heat shock proteins and heat adaptation of the whole organism. *J Appl Physiol* 83(5):1413-1417, 1997.
5. **Moseley PL**. Heat shock proteins and the inflammatory response. *Annals of the New York Academy of Sciences* 856:206-213, 1998.
6. **Moseley PL**. Exercise, stress, and the immune conversation. *Exercise and Sports Scien. Revs.* 28:3, July 2000

7. Moseley PL. Stress proteins and the immune response. *Immunopharmacology* 48 (2000) 299-302.
8. Yamada P, Amorim F, Moseley P, Schneider S: A Review: HSP 72 Response to Exercise in Humans. *Sports Medicine* (in revision)

Chapters in Edited Volumes

1. Hunninghake GW and Moseley PL. Immunological Abnormalities of Chronic Non-Infectious Pulmonary Diseases. In: Immunology of the Lung, J Bienenstock (Ed.), New York, McGraw Hill, pp. 345-364, 1984.
2. Metzger MJ, Sjoerdsma K, Richerson HB, Moseley PL, Zavala D, Monick M and Hunninghake G. Platelets in Bronchoalveolar Lavage from Asthmatic Patients and Allergic Rabbits with Allergen-Induced Late Phase Responses. In: PAF, Platelets, and
3. Asthma, G Menz, CP Page and M Schmitz-Schumann (Eds.), Agents & Actions Supplements, Vol. 21, pp. 151-159, 1987.
4. Moseley PL. Drug-Induced Lung Disease. In: Foundations of Respiratory Care, D J Pierson (Ed), Churchill Livingstone, Inc., 1991.
5. Moseley PL. Exercise, Heat, and Thermotolerance: Molecular Mechanisms. In: Exercise, Heat, and Thermoregulation, E Nadel (Ed.), Benchmark Press, 1993.
6. Moseley PL and Oppenheimer D. JI Frey and B Fornoff (Eds.). Respiratory Care. (Chapter IV) In: Speech Pathology for Tracheostomized and Ventilator Dependent Patients, Voicing, Inc., Newport Beach, CA, pp. 184-256, 1993.
7. Moseley PL. Heat Shock Proteins and Endotoxin. In: Exercise and Thermoregulation, J Sutton and R Balnave, (Eds.), Published by Faculty of Health Sciences of the University of Sydney, Australia, pp. 95-103, 1995.
8. Moseley PL. Thermal Protection: The Role of Heat Shock Proteins and Epithelial Barrier Integrity. In: Exercise and Thermoregulation, J Sutton and R Balnave, (Eds.), Published by Faculty of Health Sciences of the University of Sydney, Australia, pp. 181-189, 1995.
9. Moseley PL. Heat Shock Proteins and Fever. In: Fever: Basic Mechanisms and Management, 2nd edition, P Mackowiak (Ed.), Published by Raven Press. 1996.
10. Roach R and Moseley PL. Effects of High Altitude. In: Allergy and Respiratory Disease in Sports Medicine, JM Weiler (Ed.), Published by Raven Press. 1997.
11. Moseley PL. Heat Shock Proteins and the Inflammatory Response. (Chapter V) In: Molecular Mechanisms of Fever, M Kluger, T Bartfai and CA Dinarello, (Eds.), Published by Annals of the New York Academy of Sciences, Vol. 856, pp. 206-213, 1998.
12. Iwamoto G and Moseley PL. Modulation of Cytokines by the Heat shock Response. In: Renal Cell Carcinoma, D Schnorr, SA Loening, (Eds.), Published by Blackwell Wissenschaft-Verlag, Berlin, Germany, pp. 29-34, 1998.
13. Roigas J, Meyer D, Wallen ES and Moseley PL. Cytokines and Renal Carcinoma. The role of HSP72 in tumor cells by activated natural killer cells. In: Renal Cell Carcinoma, D Schnorr, SA Loening, (Eds.), Published by Blackwell Wissenschaft-Verlag, Berlin, Germany, pp. 181-187, 1998.
14. Moseley PL, Wallen ES and Roigas J. Heat Shock Protein Vaccines for Tumor Immunotherapy. In: Renal Cell Carcinoma, D Schnorr, SA Loening, (Eds.), Published by Blackwell Wissenschaft-Verlag, Berlin, Germany, pp. 188-193, 1998.
15. Moseley PL. Exercise and Stress Response: The Role of Stress Proteins. M Locke, EG Noble, (Eds.), Published by CRC Press LLC, Boca Raton, Florida, pp. 179-195, 2002.

Patents Awarded

1. U.S. Patent Number 5,747,332 Awarded, "Methods for Purifying and Synthesizing Heat Shock Protein Complexes"
2. Federal Republic of German Patent Number 297 24 684.4 Awarded "Methods for Synthesizing Heat Shock Protein Complexes"

3. U.S. Patent Number 5,981,706 Awarded, "Methods for Synthesizing Heat Shock Protein Complexes"
4. U.S. Patent Number 6,066,716 Awarded, "Purified Heat Shock Protein Complexes"
5. U.S. Patent Number 6,433,141 Awarded, "Purified Heat Shock Protein Complexes"
6. U.S. Patent Number 6,455,493 Awarded, "Methods for Using Heat Shock Protein Complexes"
7. U.S. Patent Number 6,713,608 Awarded "Purified Heat Shock Protein Complexes"

Other Writings and Scholarly Products

1. Moseley PL. The Hot Weather Athlete: New Findings About Old Myths. *Masters Sports* Vol. 5, No. 8, 1995.
2. Moseley PL. Do You Get a Good Workout in Bad Air? *Masters Sports* Vol. 6, No. 8, 1996.
3. Moseley PL. Course syllabus for Advanced Exercise Physiology Seminar 27:242: Temperature Regulation, University of Iowa, 1995.

Narrative Description of Research

My research focuses on the role of the cellular heat shock protein (HSP) response in the adaptation of the whole organism. In the intracellular environment, the HSPs serve as protein transporters and are associated with tolerance to a variety of stresses. Our research group made the initial observations that alterations in cellular HSP accumulation occur in humans under physiologic conditions, and that a conditioning heat stress sufficient to cause HSP accumulation protects the whole organism from endotoxin exposure.

We have also explored the mechanisms behind the differential regulation of the heat shock response by oxidants, and demonstrated that the inability of aged organisms to accumulate HSP70 following heat stress reflects an alteration in gene regulation rather than a loss of potential to produce HSP70. Using both cellular systems and studies in the intact organism, our research group has identified gut injury and the loss of epithelial barrier integrity as early and perhaps pivotal events in the pathogenesis of heat stress.

In contrast to the stress tolerance associated with intracellular HSP accumulation, HSPs seen in the local extracellular environment-either on the cell surface or released from injured cells-activate a potent immune/inflammatory response. HSP70 found on the surface of certain cells, principally tumor cells and virus-infected cells, is associated with Natural Killer cell killing. In addition, vaccines composed of HSP-tumor peptide complexes have shown promise in the generation of a specific cytotoxic T-lymphocyte response to implanted tumors in animals. My laboratory has focused on the mechanism of HSP70 mediated tumor cell recognition and on the development of HSP70-peptide complexes as vaccines. Our patents on methods to purify and synthesize these HSP-peptide complexes will allow us to conduct a variety of studies on the immune response to tumors, and make possible a number of studies and potential treatment applications.

Finally, we have developed a paradigm to reconcile the seeming dichotomy of intracellular HSPs as cellular protectors and extracellular HSPs as inflammatory activators, which is based on our demonstration that HSPs are essential for the replication of the CELO adenovirus. These data support an evolutionary rationale for the immune-activating effects of extracellular HSPs, namely an adaptive response to this viral HSP requirement. Our recent collaborative work in Human Immunodeficiency virus (HIV) and Hantavirus (SNV) models demonstrate a similar role for HSPs in the replication of these viruses. Given the broad evolutionary distances between the CELO adenovirus, HIV and SNV, these findings support the concept that HSPs are central to viral replication strategies.

Current Grant and Contract Funding

1. Project Title: "Heat Stroke and Hyperthermia: Molecular Mechanisms"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: National Institutes of Health, NIH RO1-AR40771
Duration of Award: July 1, 2002 – June 30, 2008 (years 11-15)
Percent Effort 20%

2. Project Title: NIEHS Environmental Health Sciences Center
"Environmental Respiratory Diseases in Native Americans"
Principal Investigator: Scott Burchiel, Ph.D.
Funding Organization: Pope L. Moseley, M.D., M.S., Deputy Director
National Institute of Environmental Health Sciences,
NIEHS P30-ES012072
Percent Effort 10%
Duration of Award: April 1, 2003 to March 31, 2008

3. Project Title: Biology of Infectious Diseases and Inflammation Training Grant
Principal Investigator: Mary Lipscomb, M.D.
Funding Organization: National Institute of Health/NIAID, 1 T32 AI07538
Duration of Award October 1, 2003 to September 30, 2008

4. Project Title: Clinical Translational Science Center Planning Grant
Principal Investigator: Mark Burge, M.D.
Pope L. Moseley, M.D., M.S., co-director, Career Development Core
Funding Organization: National Institute of Health, P20 RR023493
Percent Effort 10%
Duration of Award October 1, 2006 to September 30, 2008

5. **Pending:**
Project Title: University of New Mexico Clinical Translational Science Center
Principal Investigator: Mark Burge, M.D.
Pope L. Moseley, M.D., M.S., co-director, Participant and Clinical Interactions Core (PCIR)
Funding Organization: National Institute of Health, RM-07-007
Percent Effort 10%

Past Grant and Contract Funding

1. Project Title: NIEHS Environmental Health Sciences Center
"Environmental Respiratory Diseases in Native Americans"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: National Institute of Environmental Health Sciences,
NIEHS P20-ES012072
Duration of Award: April 1, 1999 to March 31, 2003

Note: Scott Burchiel, Ph.D., Deputy Director, assumed directorship on 10/01/01 when I became Chair of Internal Medicine

2.

<u>Project Title:</u>	"Role of Vpu in HIV-1 Particle Exit"
<u>Principal Investigator:</u>	Antonito T. Panganiban, B.S., Ph.D.
<u>Collaborator:</u>	Pope L. Moseley, M. D., M.S.
<u>Funding Organization:</u>	National Institutes of Health
<u>Duration:</u>	April 1, 2001 to March 31, 2006
3.

<u>Project Title:</u>	"GI Barrier Heat Injury: Systemic and Molecular Mechanisms"
<u>Principal Investigator:</u>	Larry Oberley, Ph.D.
<u>Co-Investigator:</u>	Pope L. Moseley, M.D., M.S.
<u>Funding Organization:</u>	National Institute of Health, NIH RO1-HL61389
<u>Duration of Award:</u>	December 1, 1998 to November 30, 2003.
4.

<u>Project Title:</u>	"Heat Shock Protein Regulation with Stress and Aging"
<u>Principal Investigator:</u>	K. Kregel, Ph.D.
<u>Co-Investigator:</u>	Pope L. Moseley, M.D., M.S.
<u>Funding Organization:</u>	National Institute of Health, NIH R01-AG14687
<u>Duration of Award:</u>	September 1, 1998 to August 31, 2003
5.

<u>Project Title:</u>	Role of Heat Shock Response in Activation of a Zoonotic Virus
<u>Principal Investigator:</u>	Brian L. Hjelle, M.D.
<u>Collaborator:</u>	Pope L. Moseley, M.D., M.S.
<u>Funding Organization:</u>	NIH
<u>Duration:</u>	February 1, 2001 to January 31, 2002
6.

<u>Project Title:</u>	Asthma Research Center-Pilot Project Program
<u>Principal Investigator:</u>	Mary Lipscomb, M.D.
<u>Co-Investigator:</u>	Pope L. Moseley, M.D., M.S. (Pilot Project Program Director)
<u>Funding Organization:</u>	American Lung Association Asthma Research Center, RFA ES-98004
<u>Duration of Award:</u>	January 1, 1997 to December 31, 2001
7.

<u>Project Title:</u>	"Uranium Education in the Navajo Nation"
<u>Principal Investigator:</u>	M. Bauer, Ph.D., DINE College, D. Coultas, M.D.
<u>Co Investigator:</u>	Pope L. Moseley, M.D., M.S.
<u>Funding Organization:</u>	National Institute of Environmental Health Sciences
<u>Duration of Award:</u>	October 23, 1996 to September 29, 2000
8.

<u>Project Title:</u>	"Use of Biomarkers to Optimize Heat Acclimatization in Women"
<u>Principal Investigator:</u>	Carl V. Gisolfi, Ph.D.
<u>Co-Investigator:</u>	Pope L. Moseley, MD, M.S.
<u>Funding Organization:</u>	Dept. of Defense Women's Health Research Program, DAMD 17-95-C-5093
<u>Duration of Award:</u>	September 1995 to February 1999
9.

<u>Project Title:</u>	"Identify the Relationship Between Exposures and Health Concerns in Persian Gulf War Veterans"
<u>Principal Investigator:</u>	J. A. Merchant
<u>Funding Organization:</u>	Centers for Disease Control

Duration of Award:

December 1, 1994 to November 30, 1996

10. Project Title: "Mechanisms of Bleomycin Lung Disease"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: National Institutes of Health R27-HL40349, First Award
Duration of Award: April 1988 to September 1994
11. Project Title: "Molecular Biology of Bleomycin-DNA Interactions"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: American Cancer Society, Institutional Research Award
Duration of Award: October 1986 to June 1987
12. Project Title: "Granulocyte Augmentation of Drug-Induced Lung Injury"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: National Institutes of Health Clinical Investigator Award, K08-HLO1366
Duration of Award: July 1985 to June 1990
13. Project Title: "Lung Parenchymal Injury Induced by Environmental Factors"
Principal Investigator: Pope L. Moseley, M.D., M.S.
Funding Organization: National Institutes of Health, RO3-04-018-56
Duration of Award: July 1983 to June 1985

Research Awards Granted to Trainees

1. National Institutes of Health Institutional Training Grant T32 HLO7638. Awarded: Shawn Flanagan; Sponsor: P. L. Moseley. July 1991-June 1993, \$9,600.
2. National Institutes of Health Clinical Associate Physician Award: "Organic Dust Disease: Mechanisms Related to the Stress Protein (HSP) Response", PI: J. I. Gotchall; Sponsor: P. L. Moseley, December 1992-November 1995, \$57,500/year.
3. Iowa Cardiovascular Center-Institutional Research Fellowship. Awarded: L. Solomon, Ph.D.; Sponsor: P. L. Moseley, August 1987-July 1988, \$17,000.
4. University of Iowa Interdisciplinary Research Assistantship Program. Awarded: Alan Ryan; Sponsors: P. L. Moseley and C. V. Gisolfi, June 1990-May 1991, \$11,000.
5. American Heart Association Fellowship. Awarded: Larry Solomon; Sponsor: P. L. Moseley, July 1990-June 1991, \$17,000.
6. Gatorade Sports Science Institute Student Research Award. Awarded: Shawn Flanagan; Sponsor: P. L. Moseley, October 1994-September 1995, \$1,000.
7. Deutscher Akademischer Austauschdienst (German Academic Exchange Service). Awarded: Jan Roigas, M.D. Sponsor: P. L. Moseley, June, 1995-Nov., 1996, \$60,000.
8. American Physiological Society's Perkins Memorial Award. Fellowship Awarded: Karol Dokladny, PhD. Sponsor: P. L. Moseley, 1999.
9. National Institutes of Health Institutional Training Grant T32 AI07538. Awarded: Karla Melendez, Sponsor: P. L. Moseley, 2000 to 2003.
10. Coor de Nacao de Aperfeicoamento de Pessoal Ensino Superior, Awarded: Fabiano Amorim

Classroom, Seminar or Teaching Laboratory

<u>Year</u>	<u>Course Title</u>
1986, 1992	Introduction to Clinical Medicine (5/5 rating from students), University of Iowa.
1986	Lectures in Pulmonary Medicine to second-year medical students, University of Iowa.
1986-1995	Faculty advisor, MSTP seminar series, University of Iowa.
1986-1995	Introductory Lectures to Fellows on pulmonary mechanics, University of Iowa.
1989-1995	Lectures in Advanced Course of Exercise Physiology 27:141, (4 lectures/semester), University of Iowa.
1991-1995	Medical Biochemistry Lectures 99:163 (1 lecture/semester), University of Iowa.
1991	Occupational Medicine Lectures Series, "Occupational Asthma", University of Iowa.
1991	Occupational Medicine Lectures Series, "Occupational Asthma", University of Iowa.
1991-1995	Advanced Exercise Physiology Seminar 27:274 (2 lectures/semester), University of Iowa.

Post Doctoral Mentoring

1. Larry Solomon, Ph.D., Postdoctoral Research Fellow, 1987-1988.
2. Alan Ryan, Ph.D. 1992-1994.
3. John Gotchall, M.D., Pulmonary/Critical Care Fellow, 1988-1992.
4. Jan Roigas, M.D., Post-doctoral Fellow, DAAD awardee, Humboldt University, Berlin, Germany, 1994-1996.
5. Clement Singarajah M.D., Pulmonary/Critical Care Fellow 1996-1998.
6. Ilka Frerking M.D. 1997-1998.
7. Karol Doklodny, PhD., Post-doctoral Fellow, Nicholai Copernicus University, Poland, 1999-2001.
8. Craig A. Jensen, M.D., Pulmonary/Critical Care Fellow, 2001-2003

Ph.D. Student Mentoring

1. Alan Ryan, Ph.D., awarded 1992.
2. Shawn Flanagan, Ph.D., awarded 1996.
3. Lisa Ridnar, Ph.D., Comprehensive Examination Committee, Radiation Biology, 1991.
4. James Elwell, Ph.D., Comprehensive Examination Committee, Radiation Biology, 1990.
5. Joseph Paulus, Ph.D., Comprehensive Examination Committee, Bioengineering, 1993.
6. J. J. Li, Ph.D., Comprehensive Examination Committee, Radiation Biology, 1993.
7. David Hall, Ph.D., Comprehensive Examination Committee, Exercise Science, 1993.
8. Xho Shi, Ph.D., Comprehensive Examination Committee, Exercise Science, 1992.
9. Karla Melendez, Ph.D., Biochemistry and Molecular Biology, awarded 2003.
10. Paulette Yamada, Ph.D., Comprehensive Examination Committee, Exercise Science, 2007.
11. Fabiano Amorim, Ph.D.candidate, Coor de Nacao de Aperfeicoamento de Pessoal Ensino Superior

Masters Student Mentoring

1. Ray Tai Chung, Masters Comprehensive Examination, Exercise Science, 1992.
2. Michael Massett, Comprehensive Examination Committee, Exercise Science, 1994.

Pre-Baccalaureate Student and Honors Student Mentoring

1. Sally York, Honors Biochemistry Student, 1985-1986.
2. Mark Kohmetscher, Senior Honors Student, Exercise Science, 1990-1991.
3. Chris Gapen, Senior Honors Student, Exercise Science, 1991-1993.
4. Aaron Hoyle, Senior Honors Student, Exercise Science, 1992.
- Alice Garry, Undergraduate Student Research Project, 1993-1994.
- Diane Duba, Senior Honors Student, Exercise Science, 1993.
5. Karin Bistline, Senior Honors Student, Exercise Science, 1994.
6. Macke'Jo Heard, Senior Honors Student, Psychology, 1998-1999.
7. Emiliano Valles, Biology, 2004
8. Marc Mabry 2005

Classroom, Laboratory Teaching, and Tutoring

1. Pulmonary Function lecture to Phase III students.
2. Research Lecture to Frontiers in Biomedical Sciences to graduate students.
3. Asthma and COPD Lecture to Masters Nursing students.

Present Patient Care Activities

1. Attending Physician, Medical Intensive Care Unit.
2. Attending Physician, Pulmonary Consultation Service.
3. Attending Physician, Occupational Lung Clinic.
4. Attending Physician, Multi-Disciplinary Toxicology Clinic.

University, SOM, HSC, Administrative Duties

Senior Advisory Group, Department of Internal Medicine, University of New Mexico
Executive Committee, Department of Internal Medicine, University of New Mexico
Ad Hoc Committee to Review Recommendations for Appointment/Promotion to Professor & Tenure,
School of Medicine, University of New Mexico
Search Committee for Respiratory Disease Research Scientists, Lovelace Respiratory Research
Institute
Tobacco Settlement Fund Committee, University of New Mexico
Intel Risk Management Task Force

University of Iowa

Reviewer for Clinical Research Center Study Protocols, University of Iowa.
Honors Program Committee, University of Iowa.
Promotions Review Committee, Department of Internal Medicine, University of Iowa.
Occupational Medicine Residency Committee, University of Iowa.
Chairman, Promotions Review Committee, Department of Internal Medicine, University of Iowa.
Respiratory Therapy Committee, VA Hospital, University of Iowa.
Ambulatory Practice Committee, Department of Internal Medicine, University of Iowa.

University of New Mexico

Health Sciences Center Committee on Rural Health, University of New Mexico, School
of Medicine.
Advanced Residency Committee, University of New Mexico, School of Medicine.
Outreach Steering Committee, Department of Internal Medicine, University of New
Mexico, School of Medicine.
Howard Hughes Medical Institute Research Committee, University of New Mexico,
School of Medicine.
University of New Mexico MBRF Scientific Advisory Committee, University of New
Mexico.

Co-Director, Task Force on Outcomes, Health Management Guidelines Group,
University of New Mexico, School of Medicine.
Strategic Planning Committee, Research Work Group, UNM Cancer Research and
Treatment Center, University of New Mexico, School of Medicine.
Health Sciences Center Research Committee, University of New Mexico, School of Medicine.
Development Committee, Department of Epidemiology, University of New Mexico,
School of Medicine.
Chair, Research Executive Committee, University of New Mexico, School of
Medicine.
Chair, Transition group UNM/National Foundation for Functional Brain Imaging.
Member, University of New Mexico Presidential Search Committee, 2002-2003
Member, UNMHSC Clinical Executive Council (CEC), Aug 2004-present
Co-Chair, Uncompensated Care Task Force, July 2004-present
Senior Advisory Committee, Faculty Practice Organization (FPO)
Member, Search Committee for Senior Associate Dean for Research, 2005
Member, Research Strategic Planning Committee (RSPC) July- present
Chair, Search Committee for Chair of Pathology, August 2005-present
Member, Clinical Translational Science Award (CTSA), November 2005-present
Member, Clinical Translational Science Award/Career Development Program (CTSA-CDP)
November 2005-present

State and National

American Federation for Clinical Research, Midwest Region, Councilor.
National Cancer Institute Advisory Panel on the Biochemical Effects of Pesticide Exposures.
Consultant on Workers' Safety, Iowa Department of Transportation.
Abstract Review Committee, Midwest Section, American Federation for Clinical Research,
Pulmonary Subspecialty Section.
Consultant, American Board of Preventive Medicine, Board Review Course.
Membership Committee, American Thoracic Society
NIH/APS/ACSM, Working Group on Integrative Biology in Cardiac and Vascular
Diseases
State of New Mexico Governors Advisory Board on Respiratory Care
Advisory Board, National Environmental Respiratory Center, Environmental Protection Agency.
Consultant on Agricultural & Environmental Health, Texas Tech University, Lubbock, TX.
Western Society of Clinical Investigation, Councilor.
American Thoracic Society, Health Care Policy Committee
Western Association of Physicians, Councilor
American Thoracic Society Public Policy Committee 2002 – Present
Biomedical Research Institute of New Mexico (BRINM), April 2005-2007
APM Communications Committee July 2002-2006
AAIM Professional Development Task Force, 09/04/03-08/04/04

**Frank Grimaldi
Deposition Exhibit 5,
pp. 2-3**

Finally for purposes of this summary, but not the end of a long list of related research demonstrating that football helmets are responsible for retaining heat, is an article in *The Physician and Sportsmedicine*, titled "Heat Balance Limits in Football Uniforms" which reference two other articles by Fox and Mathews from 1966 and 1969. "Fox et al were among the first investigators to show clear qualitative effects of exercising in a football uniform on physiological variables, including heart rate, pulmonary ventilation, energy cost, core temperature (T_c), and water loss. Similarly, Mathews et al reported that a full football uniform impedes evaporative heat loss by 60% to 70% compared with less burdensome clothing ensembles and produces increases in rectal temperature 50% greater than those of subjects wearing only shorts."

With relevant data from all these published articles, several of which were years before the Korey Stringer heat-related death, why was the public not given any warnings about these dangers for athletes playing football?

The public and the football community are very well informed about improvements made to certain football equipment, particularly helmets and shoulder pads, when it relates to their safety in helping to prevent serious injury. There also are warning labels about proper contact to prevent injury.

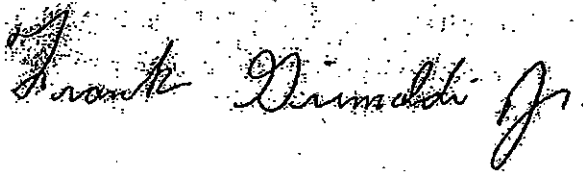
At no time, in my many years as a Certified Athletic Trainer and board-certified Physician Assistant working with football players at all levels and my past participation on an advisory board for a football helmet manufacturing company, was there ever any mention by a manufacturer of football equipment that the helmet possibly could cause health risks due to the retention of heat by the body, which may result in serious heat illness or death. Why not include warnings about possible heat-retention complications?

The users of football helmets and other equipment hear about heat-related deaths involving football players, but are never told that the risk and possible cause of the heat-related death may have been due to the helmet. All the users of football helmets and other equipment know is that the death occurred on a hot and humid day.

There should be relevant warnings placed on football equipment, such as helmets, informing individuals of possible heat problems related to wearing this required equipment.

In summary:

1. A non-acclimated athlete, such as Korey Stringer, needs to participate in football with less equipment until he has been properly acclimated to the weather conditions.
2. Any individual required to wear football equipment, particularly helmet and shoulder pads, needs to be warned by the manufacturer that his equipment will prevent body heat from escaping, possibly causing heat illness and/or death. Similar warnings are currently provided on helmets pertaining to proper contact techniques.
3. Athletes should not be required to participate for extended periods, such as Korey Stringer did, wearing this equipment due to the increased risk of heat-related problems.
4. Prevention is the key to avoid serious complications caused by heat-related illnesses.
5. The NFL needs to take a pro-active approach to assure its athletes are given proper uniforms and equipment along with appropriate warning to protect them from all possible complications while playing football.
6. To a reasonable degree of certainty as a certified athletic trainer, it is my opinion that it is more probable than not, Korey Stringer would not have suffered such a serious heat illness if he had not been wearing a helmet, shoulder pads and full uniform.

A handwritten signature in cursive script, reading "Frank Grimaldi Jr.", is positioned above the printed name. The ink is dark and the signature is fluid.

Frank Grimaldi Jr.